Solutions and Solubility Problems – Set 1

1. A 12.0 gram sample of aluminum nitrate is dissolved in water, to give 400 mL of solution. Calculate the concentrations of aluminum nitrate, aluminum ions and nitrate ions. [ 4 marks ]

2. What is the total volume of 3.0 mol/L sulphuric acid that can be prepared from 5.0 L of a concentrated sulphuric acid solution (conc. = 18.0 mol/L)? [ 4 marks ]

3. What mass of solid silver will be produced when 0.239 grams of tin metal is added to 250.0 mL silver nitrate solution that has a concentration of 0.0300 mol/L? The balanced equation is [ 7 marks]

Sn(s) + 2 AgNO3(aq) → 2 Ag(s) + Sn(NO3)2(aq)

4. 80.0 mL of 0.15 mol/L aqueous ammonium sulphide is reacted with 120.0 mL of 0.45 mol/L iron (III) chloride, producing solid iron (III) sulphide and aqueous ammonium chloride. The balanced equation is:

3 (NH4)2S(aq) + 2 FeCl3(aq) → Fe2S3(s) + 6 NH4Cl(aq)

Identify the limiting reactant, and then calculate the maximal amount of iron (III) sulphide produced.

[ 7 marks ]

5. 25.0 mL of 0.3 mol/L potassium phosphate is mixed with 85.5 mL of 0.74 mol/L potassium chloride. What is the total concentration of potassium ions after the two solutions are mixed together? [ 8 marks]

Answers:

1. 0.141 mol/L Al(NO3)3, 0.141 mol/L Al3+, 0.423 mol/L NO3-

2. Volume (Dilute) = 30.0 L

3. Mass of Ag(s) = 0.434 grams

4. (NH4)2S is limiting reactant; Mass Fe2S3 = 0.83 grams

5. Concentration of K+ ions = 0.776 moles/L